

UNITED STATES PATENT APPLICATION

FOR

A METHOD AND SYSTEM FOR NAVIGATING A DISPLAY SCREEN FOR  
LOCATING A DESIRED ITEM OF INFORMATION

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# A METHOD AND SYSTEM FOR NAVIGATING A DISPLAY SCREEN FOR LOCATING A DESIRED ITEM OF INFORMATION

## BACKGROUND OF THE INVENTION

### 5 FIELD OF THE INVENTION

The present invention relates to the field of computer systems and data communication. More specifically embodiments of the present invention relate to the field of displaying information on screens of portable electronic devices, such as personal computers, personal digital assistants (PDAs), cell phones, pagers,  
10 digital watches, etc.

### RELATED ART

The popularity of portable computers caused consumer demand for new  
15 features that are commensurate with the nature and method of use of portable devices. Furthermore, the advent of the Internet and ever increasing reliance on electronic mail presented more requirements regarding how portable devices interface with the Internet and electronic mail systems.

20 To respond to the market demand, manufacturers incorporated customer requirements into the design of their new products and made improvements in their existing capabilities. An improved portable computer, responding to the consumer requirements, requires a display capable of showing a plurality of icons and information. The icons may represent any information, e.g., an  
25 assortment of sorted data in a data base, pages of information down-loaded from

the Internet, pages of text received via electronic-mail, and in some instances maps of cities displaying street lay-outs and the like.

Displaying pages of textual data, maps of cities or the ever-increasing number of icons takes a vast amount of display screen area. However, supporting such features is not compatible with the customer requirements for a "small size device." Therefore, the designers of a portable computer have to either limit their designs to display screens capable of displaying a smaller amount of information or to enlarge the size of the display, neither of which may satisfy all customer requirements.

Furthermore, portable electronic devices are typically employed while the user is on the run, e.g., in business meetings, on business travel, personal travel, in a vehicle, on foot, etc. Ideally, a user of a portable device needs to retrieve a maximum amount of information, display the information on a limited amount of display space, and in the shortest period of time. Such constraints can benefit from an improved system or an improved method for searching and presenting the information to the user. Conventional portable electronic devices can benefit from improved methods of retrieving, displaying and legibly presenting information to users.

Thus a need exists for a device capable of retrieving information with a minimum number of inquiries. Furthermore, a need exists for a user to be able to



## SUMMARY OF THE INVENTION

An embodiment of the present invention enables a user to retrieve a desired item of information from a large number of items of information stored in a portable computer with a minimum number of inquiries. Typically, the information displayed on a display screen of the portable computer is virtually expanded in all directions, outside the viewing area of a user of the portable computer.

Furthermore, zoomed-out fonts and images are used to fit large documents received from the Internet, via the e-mail or the like on a small display screen of a portable computer. An electronic magnifier is placed over the zoomed-out information displayed on the display screen.

The magnifier can be used, similar to a pointer in a conventional personal computer, to scroll the displayed information in all directions while the information passes under the magnifier. As the information passes under the magnifier, a user can bring to view the information beyond the viewing area and with enhanced legibility due to magnification.

According to one embodiment of the present invention a user points a pointer (e.g., a stylus, a mouse pointer, or even the user's finger) at the display screen invoking a Fly Over user interface (FOUI). Invocation of the FOUI initiates a search or a navigation session. The navigation session is initiated when the current view is zoomed-out and a magnifying rectangle appears on the display screen over the displayed items of information. Accordingly, the items of

information directly under and within the magnifying rectangle are zoomed-out by an order of  $2^{-n}$  degrees of magnification, which makes the information clearly visible and legible to the user. In one embodiment of the present invention a user determines the degree of magnification and zoom-out of the items.

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Another embodiment of the present invention enables a user to scroll the displayed information by moving the magnifying rectangle in all directions in search of the desired item of information while the displayed information are passing under the magnifying rectangle and are magnified. The present invention enables a user to search for information in different layers and sub-layers. The user may terminate the navigation session by removing the pointer from the display screen and the invention allows the user to resume with the normal operation of the device.

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More specifically, embodiments of the present invention are directed to a method for retrieving information providing a magnifying window on a display of a digital device wherein the display shows a plurality of items. The user activates the magnifying window by touching the screen with a pointer. The user scrolls the magnifying window over the display screen and locates a desired item of information of the plurality of items of information. By pointing on the desired item of information, detail information can be displayed. Removing the pointer from the screen deactivates magnifying window, restores view zoom factor and terminates the navigation session.

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Embodiments of the present invention are also directed to a method and a system for navigating through information of a display screen to search for a desired item of information stored in an electronic device. The electronic device includes a user interface capable of receiving commands from a pointer to activate a magnifying window. A user may commence a navigation session by touching the display screen in a non-active area or by clicking on a specifically designated icon to activate the user interface. The user interface enables the user to scroll the magnifying window in all directions over the zoomed-out display to find a desired item of information. The display may be a display screen of a digital device (e.g., portable computer, personal computer, a cellular telephone, a digital watch, etc). The user may drag the pointer over the desired item of information to retrieve detailed information contained therein. The user may terminate a navigation session by removing the pointer from the screen and resuming normal operation.

## BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 depicts a typical portable computer with a plurality of icons displayed on its display screen.

5        Figure 2 depicts the display screen of a typical portable computer when a navigation session is initiated and, in response, the display is zoomed-out and a magnifying rectangle appears on the display screen.

10        Figure 3 illustrates the movement of a magnifying rectangle and the scrolling of the information while a user is searching for a desired item of information.

15        Figure 4A and Figure 4B illustrate a search for a desired item of information while FOUI magnifies the displayed information thereby enhancing the visibility and facilitating the search.

20        Figure 5A is an exemplary illustration of an embodiment of the present invention searching for and finding an address on a portable computer.

25        Figures 5B, 5C and 5D are an exemplary illustrations of embodiments of the present invention viewing the address and a map of a desired address.

Figure 6 is a flowchart of the steps of a process 600 of initiating a Fly Over user interface (FOUI) and navigation of information in search of a desired item of information in accordance with an embodiment of the present invention.



## DETAILED DESCRIPTION OF THE INVENTION

Reference will now be made in detail to the preferred embodiments of the present invention, a method and a system for navigating a display screen for locating a desired item of information, examples of which are illustrated in the accompanying drawings. While the invention will be described in conjunction with the preferred embodiments, it will be understood that they are not intended to limit the invention to these embodiments. On the contrary, the invention is intended to cover alternatives, modifications and equivalents, which may be included within the spirit and scope of the invention as defined by the appended claims.

The present invention is compatible with any electronic device having a wireless or other communication mechanism and contains organized records of information, such as a portable computer system, a cell phone, a digital watch or a pager. One of the common types of electronic systems, which can be used in accordance with one embodiment of the present invention, is referred to as a personal digital assistant, or commonly called a PDA. The PDA is a pocket sized electronic organizer with the capability to store telephone numbers, addresses, daily appointment, and software that keeps track of business or personal data such as expenses, etc. Furthermore, the PDA also has the ability to connect to a personal computer, enabling the two devices to exchange updated information that is synchronizing the information between the two devices. Additionally, the PDA can also be connected to a modem, enabling it to have electronic mail (e-

mail) capabilities over the Internet along with other Internet capabilities.

Moreover, an advanced PDA can have Internet capabilities over a wireless communication interface (e.g., radio interface).

5 In particular, the PDA can be used to browse Web pages located on the Internet. The PDA can be coupled to a networking environment. It should be appreciated that embodiments of the present invention are well suited to operate within a wide variety of electronic systems (e.g., computer systems) which can be communicatively coupled to a networking environment, including cellular phones,  
10 digital watches, pagers, etc.

Figure 1 depicts an exemplary Personal Digital Assistant (PDA) 100. The PDA 100 is also known as a palmtop or palm-sized electronic device or portable computer system. The PDA 100 stores substantial items of information in its  
15 memory. The information may be stored in accordance with a plurality of views of a database organized in different files created by a user. Numerous icons, represented by circles in Figure 1, displayed on display screen 110 may represent a plurality of databases or files stored in memory. Each icon displayed on display screen 110 is labeled to identify the file or the database it represents.

20 For example icon 130 may represent a file storing all received e-mails. Similarly icon 120 may represent a file where maps of different cities are stored, or icon 150 may be associated with a data base view of all expenses by the user

during January 2000. A user can retrieve information associated with an icon by activating that particular icon. An icon may be activated in a variety of methods (e.g., touching the icon with a stylus, touching the icon with the user finger, touching the icon with a pointer or the likes).

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The PDA 100 also has the capability to transmit and receive data and information over a wireless communication interface (e.g., a radio interface). The PDA 100 is an exemplary implementation of fly over user interface (FOUI).

10 In one embodiment of the present invention icon 190 is specifically designed for the purpose of invoking "FOUI". A user can invoke fly over user interface (FOUI) by touching a non-active area 180 of display screen 110 with stylus 210 or in the alternative click on icon 190. It is appreciated that the non-active area 180 of display screen 110 may be an area which is not occupied by  
15 icons.

Figure 2 depicts an embodiment of the present invention, where a user invokes fly over user interface (FOUI) to initiate a magnification display mode. During the magnification display mode, a larger number of icons and magnifying  
20 area 220 appear on display screen 110. Figure 2 illustrates an exemplary view of display screen 110 during a magnification display mode while magnifying area 220 is placed over icon 230. Icon 230 viewed through magnifying area 220 appears larger than its original size and relative to the other icons on display

screen 110. During magnification display mode, not all icons can be displayed on display screen 110. The display of some of the icons is extended beyond the borders of display screen 110. However, all icons can be brought into view on display screen 110 by scrolling the icons in directions 130', 140 and 160 of

5 Figure 1.

For example, Figure 1 depicts PDA 100 during a normal mode of operation showing a small number of icons on display screen 110, although a large number of icons are extended outside the viewing area and not visible to the user. Figure 10 2 illustrates the viewing area of display screen 110 after fly over user interface (FOUI) is invoked and magnification display session is initiated. During magnification display session, a larger number of icons, smaller in size, appear on the viewing area of display screen 110. Appearance of a larger number of icons on display screen 110 facilitates a subsequent search for a target icon. 15 During this session, a user has access to a larger number of icons while the user can fly over the smaller size icon with a magnifying tool, magnifying area 220, with enhanced visibility thereof.

Another embodiment of the present invention enables a user to control the 20 magnification power of magnifying area 220. For example, a user may display an object displayed through display screen 110 twice as large as its original size by selecting two degrees of magnification. By using a "2" degree of magnification, the items of information directly under and within the magnifying area 220 will be

zoomed in and appear as large as its original size, while other non-magnified items will be zoomed-out and appear smaller in size by a factor of "2," thus the zoomed in item becomes clearly visible and legible to the user.

5 A navigation session begins when a user drags magnifying area in direction 130', 140 or 160 of Figure 1, in search of an item of information (e.g., icon 330). The user drags magnifying area 220 across display screen 110 with the aid of stylus 210.

10 Figure 3 illustrates a navigation session for locating a desired item of information (e.g., icon 330). The user places stylus 210 over magnifying rectangle 220 and moves stylus 210 in direction 130', 140 and 160 of Figure 1. The user navigates display screen 110 until icon 330 is found under magnifying rectangle 220.

15 Figure 1 also depicts display screen 110 when magnification display session is terminated. In one embodiment of the present invention, the user may terminate a magnification display session by removing stylus 210 from display screen 110. When a magnification display session is terminated, display of icons  
20 on display screen 110 return to their normal size.

Figure 4A and Figure 4B illustrate one embodiment of the present invention where the user furthers the search beyond locating icon 330. The user

may activate icon 330 by pressing stylus 210 on icon 330 or double clicking on icon 330 and cause display of information, e.g., text, associated with icon 330.

In another embodiment of the present invention, the user may search for a particular line or a particular sentence within the displayed text. The search is conducted by navigating display screen 110 by moving magnifying area 220 in directions 130', 140 and 160 of Figure 1. The navigation process will continue, while the magnifying area 220 (Figure 4B) slides over the text and enhancing the legibility, until the desired line or the desired sentence is found. It is appreciated that the type of information is not limited to textual data, and in other embodiment of the present invention, the type information may be graphics, tables of numbers, calendars, maps of cities, telephone directories or the like.

Figures 5A, 5B, 5C, and 5D are exemplary illustrations of further embodiments of the present invention. According to this embodiment of the present invention, a user of system 500, equipped with FOUI, can search for an address and a direction to a named location in a city. System 500 is equipped with an internal memory (e.g., hard disk, RAM, PROM, RAM, EPROM, etc.) and may be adapted to receive an add-in memory card complying with PCMCIA (e.g., PC card). The internal memory or the add-in memory card contains the addresses for the residential and businesses located in the city B, along with the map of the city B. Furthermore, for the sake of this example, a user of the device can use system 500 to find a direction to a residential address 1322 on the 9<sup>th</sup> street.

Figure 5A depicts display screen 110 when a magnification display session has been initiated. A navigation session is initiated when magnifying area 220 appears on display screen 110. The user then can navigate display screen 110 by moving magnifying area 220 using stylus 210 in directions 130', 140, and 160 of Figure 1. As the user moves magnifying area 220 in directions 130', 140, and 160 of Figure 1, the information outside the viewing area will scroll into the user viewing area. The navigation of information and scrolling of the information may continue until the desired item of information is found and placed under magnifying area 220. Figure 5A depicts an instant where icon labeled "Addresses" is found and is under magnifying area 220.

Figure 5B illustrates the next session in the search for the desired address 1322 on the 9<sup>th</sup> street after icon labeled "addresses" is found. Figure 5B illustrates that the user has terminated magnification display session by removing stylus 210 from display screen 110. Figure 5B depicts display screen 110 in its normal mode of operation and a smaller number of icons, including the desired icon labeled "addresses" remain on display screen 110. It is appreciated that the sizes of circles, representing icons, are larger than the size of circles displayed on display screen 110 during magnification display session.

Figure 5C is another embodiment of the present invention, where the user of system 500 wishes to find the location of and a direction to 1322, 9<sup>th</sup> street

in city B continues the search and finds the list of the streets in the city. The user activates icon labeled "addresses" and a list of streets will appear on screen 110. The user scrolls the list in the directions 130, 140 or 160 of Figure 1 until 9<sup>th</sup> street appears under magnifying area 220.

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Figure 5D illustrates a view of a section of the map of the city B, where the 9<sup>th</sup> street is located. The user points stylus 220 on 9<sup>th</sup> street in Figure 5B to get geographical location of 9<sup>th</sup> street. Accordingly, location of 9<sup>th</sup> street in relation with two major Interstates freeways will appear under magnifying area 220.

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Figure 6 is a flowchart of the steps in a computer implemented process 600 for initiating a Fly Over user interface (FOUI) and navigation of information in search for a desired item of information in accordance with an embodiment of the present invention.

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In step 610 of Figure 6, in one embodiment of the present invention, a user can activate the fly over user interface (FOUI) by pointing a pointer to a non-active area of a display screen. In another embodiment of the present invention, a user can activate (FOUI) by clicking on an icon, on the display screen, which is specifically designated for activation of fly over user interface.

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In step 620 of Figure 6, the FOUI is activated and the device is in magnification display mode. A magnifying area appears on the display screen



and the user can move the magnifying area in all directions by holding the pointer on the magnifying area and dragging the pointer in different directions. During magnification display mode, a larger number of items of information, which are smaller in size, are displayed on the display screen.

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In step 630 of Figure 6, the user moves the magnifying area over the displayed information on the display screen to locate a desired item of information. Items of information appearing within the perimeter of the magnifying area are magnified according to the degree of magnification of the magnifying area and are clearly legible. It is appreciated that the degree of magnification may be user selectable.

In step 640 of Figure 6, once the user finds the desired item of information, the search may continue to get detail of the desired item of information. The user points the pointer on the desired item of information and clicks on the desired item of information.

In step 650 of Figure 6, the user may terminate the navigation session and exit FOUI by removing the pointer from the screen. Once the session is terminated, the display screen displays items of information in their normally displayed sizes.

In summary, the present invention provides a method and a system that enables a user to search through items of information, on a small display screen of a portable device, and expeditiously find a desired item of information and legibly present the item of information to the user. In accordance with the present

5 invention, the portable computer system may have the desired item of information stored in its database or in a PC card. It is appreciated that the embodiments of the present invention can be readily applied to the information received from the Internet or through the e-mail. While the present invention has been described in particular embodiments, it should be appreciated that the  
10 present invention should not be construed as limited by such embodiments, but rather construed according to the below claims.